b- $y_M(t) = y_s(t-\theta)$ avec $\theta = \frac{x}{v}$

$$\Rightarrow y_M(t,x) = 2.10^{-3}\sin\left(200\pi(t-\frac{x}{V})+\pi\right)$$

$$\Rightarrow y_M(t,x) = 2.10^{-3}\sin\left(200\pi t - \frac{200\pi x}{10} + \pi\right) \forall t \geq \theta = \frac{x}{v} = \frac{x}{10}$$

$$\Rightarrow y_M(t,x) = 2.10^{-3}\sin(200\pi t - 20\pi x + \pi) \forall t \geq \frac{x}{10}$$

3°)

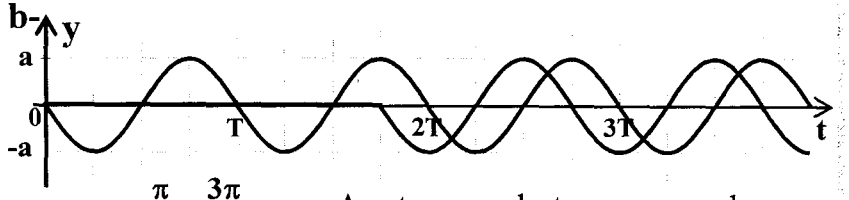
a- $x_A = 17,5cm \rightarrow \frac{x_A}{\lambda} = \frac{17,5.10^{-2}}{10^{-1}} = 1,75 \Rightarrow x_A = 1,75\lambda$

$$y_A(t) = 2.10^{-3}\sin\left(200\pi t - \frac{2\pi x 1,75\lambda}{\lambda} + \pi\right)$$

$$= 2.10^{-3}\sin(200\pi t - 3,5\pi + \pi)$$

$$\Rightarrow y_A(t) = 2.10^{-3}\sin\left(200\pi t - \frac{\pi}{2}\right) \forall t \geq \theta = \frac{x_A}{v} = 1,75T$$

b-



$\varphi_A - \varphi_s = -\pi - \frac{\pi}{2} = \frac{3\pi}{2} = \pi \Rightarrow$ **A** est eu quadrature avance de phase % à **S**.

c- $t_1 = 3,25.10^{-2}s = 3,25.T$

$$v_A = \left(\frac{dy_A}{dt}\right)_{t_1} = 2.10^{-3}.200\pi\sin(200\pi t_2) = 2.10^{-3}.200\pi\sin(2\pi \times 3,25T)$$

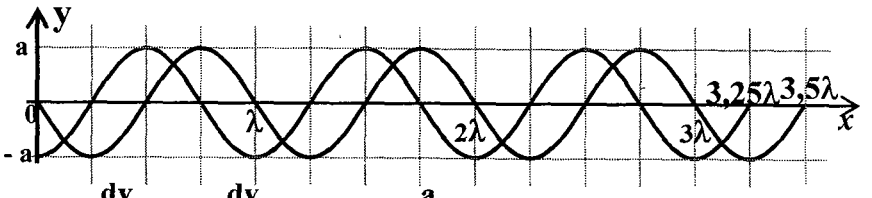
$$\Rightarrow v_A = 0,4\pi \ ms^{-1}$$

4°)

$$a - y_{t_1}(x) = 2.10^{-3}\sin\left(2\pi N t_1 - \frac{2\pi x}{\lambda} + \varphi_s\right) \forall x \leq 3,25\lambda$$

$$= 2.10^{-3}\sin\left(-\frac{2\pi x}{\lambda} - \frac{\pi}{2}\right) \forall_x \leq 3,25$$

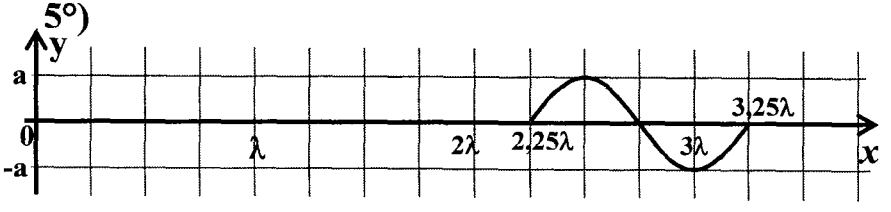
b-



c- $\frac{dy}{dt} < 0 \rightarrow \frac{dy}{dx} > 0$ et $y = -\frac{a}{2} = y_A(t_1)$

$x_1 = \frac{\lambda}{4} = 0,025m$; $x_2 = \frac{5\lambda}{4} = 0,125m$; $x_3 = \frac{9\lambda}{4} = 0,225m$; $x_4 = \frac{13\lambda}{4} = 0,325m$

5°)



Exercice N°3 :

1°) Cuve à onde.

2°) Transversale car la direction de propagation est perpendiculaire à la direction de e la déformation.

3°) Le brin monte vers le haut puis descent (il se déplace verticalement car la matière ne se déplace pas il ya un simple déplacement d'énergie).

4°) $v = \frac{d}{\Delta t} = \frac{\left(2.10^{-2} - 1.10^{-2}\right)x100}{10} = 0,1ms^{-1}$